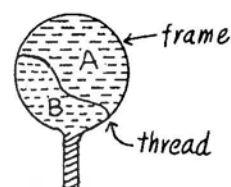


PHYSICS

1. A thin plano-convex lens acts like a concave mirror of focal length 0.2 m when silvered from its plane surface. The refractive index of the material of the lens is 1.5. The radius of curvature of the convex surface of the lens will be
 - 1) 0.4 m
 - 2) 0.2 m
 - 3) 0.1 m
 - 4) 0.75 m
2. The physical quantity having the same dimensions as Planck's constant h is
 - 1) Boltzmann constant
 - 2) force
 - 3) linear momentum
 - 4) angular momentum
3. A balloon is rising vertically up with a velocity of 29ms^{-1} . A stone is dropped from it and it reaches the ground in 10 seconds. The height of the balloon when the stone was dropped from it is ($g = 9.8\text{ ms}^{-2}$)
 - 1) 100 m
 - 2) 200 m
 - 3) 400 m
 - 4) 150 m
4. A thread is tied slightly loose to a wire frame as in figure and the frame is dipped into a soap solution and taken out. The frame is completely covered with the film. When the portion A is punctured with a pin, the thread
 - 1) becomes concave towards A
 - 2) becomes convex towards A
 - 3) remains in the initial position.
 - 4) either (1) or (2) depending on the size of A w.r.t. B
5. Oxygen is 16 times heavier than hydrogen. Equal volumes of hydrogen and oxygen are mixed. The ratio of speed of sound in the mixture to that in hydrogen is
 - 1) $\sqrt{1/8}$
 - 2) $\sqrt{32/17}$
 - 3) $\sqrt{8}$
 - 4) $\sqrt{2/17}$



(Space for Rough Work)

6. When light is incident on a diffraction grating the zero order principal maximum will be
- 1) one of the component colours
 - 2) absent
 - 3) spectrum of the colours
 - 4) white
7. H - polaroid is prepared by
- 1) stretching polyvinyl alcohol and then heated with dehydrating agent
 - 2) stretching polyvinyl alcohol and then impregnating with iodine.
 - 3) orienting herapathite crystal in the same direction in nitrocellulose.
 - 4) by using thin tourmaline crystals.
8. SI unit of permittivity is
- 1) $C^2 m^2 N^{-1}$
 - 2) $C^{-1} m^2 N^{-2}$
 - 3) $C^2 m^2 N^2$
 - 4) $C^2 m^{-2} N^{-1}$
9. A spherical drop of capacitance $1 \mu F$ is broken into eight drops of equal radius. Then, the capacitance of each small drop is
- 1) $\frac{1}{8} \mu F$
 - 2) $8 \mu F$
 - 3) $\frac{1}{2} \mu F$
 - 4) $\frac{1}{4} \mu F$
10. Two equal forces (P each) act at a point inclined to each other at an angle of 120° . The magnitude of their resultant is
- 1) P
 - 2) $2P$
 - 3) $\frac{P}{2}$
 - 4) $\frac{P}{4}$

(Space for Rough Work)

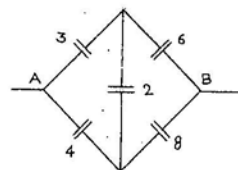
- (Space for Rough Work)

16. When a body is earth connected, electrons from the earth flow into the body. This means the body is

- 1) uncharged
- 2) charged positively
- 3) charged negatively
- 4) an insulator

17. Effective capacitance between A and B in the figure shown is (all capacitances are in μF)

- 1) $21 \mu F$
- 2) $23 \mu F$
- 3) $\frac{3}{14} \mu F$
- 4) $\frac{14}{3} \mu F$



18. Which state of triply ionised Beryllium (Be^{+++}) has the same orbital radius as that of the ground state of hydrogen ?

- 1) $n = 1$
- 2) $n = 2$
- 3) $n = 3$
- 4) $n = 4$

19. If M is the atomic mass and A is the mass number, packing fraction is given by

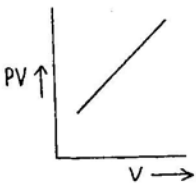
- 1) $\frac{A}{M-A}$
- 2) $\frac{A-M}{A}$
- 3) $\frac{M}{M-A}$
- 4) $\frac{M-A}{A}$

20. A count rate meter shows a count of 240 per minute from a given radioactive source. One hour later the meter shows a count rate of 30 per minute. The half-life of the source is

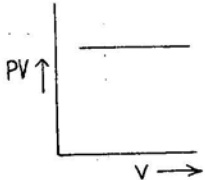
- 1) 20 min
- 2) 30 min
- 3) 80 min
- 4) 120 min

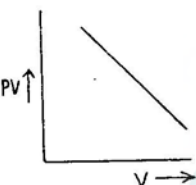
(Space for Rough Work)

21. The refractive index of a particular material is 1.67 for blue light, 1.65 for yellow light and 1.63 for red light. The dispersive power of the material is
- 1) 0.0615
 - 2) 0.024
 - 3) 0.031
 - 4) 1.60
22. An ideal gas heat engine operates in a Carnot's cycle between 227°C and 127°C . It absorbs $6 \times 10^4 \text{ J}$ at high temperature. The amount of heat converted into work is
- 1) $4.8 \times 10^4 \text{ J}$
 - 2) $3.5 \times 10^4 \text{ J}$
 - 3) $1.6 \times 10^4 \text{ J}$
 - 4) $1.2 \times 10^4 \text{ J}$
23. Which one of the following graphs represents the behaviour of an ideal gas ?
- 1)

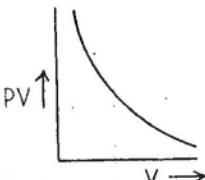


2)


- 3)



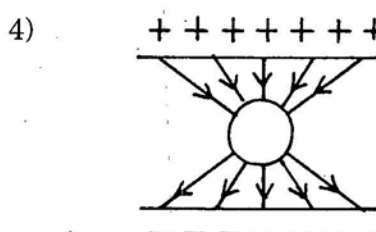
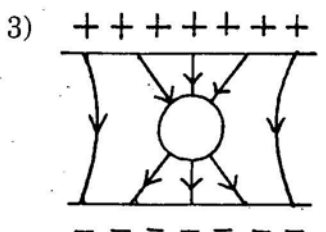
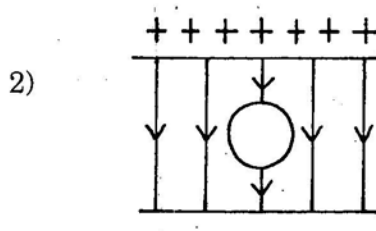
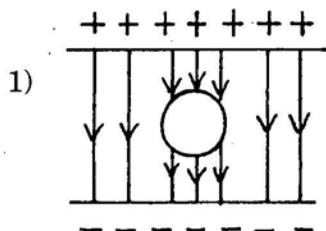
4)


24. Rainbow is formed due to
- 1) refraction
 - 2) dispersion and total internal reflection
 - 3) total internal reflection
 - 4) scattering
25. A beam of parallel rays is brought to a focus by a plano-convex lens. A thin concave lens of the same focal length is joined to the first lens. The effect of this is
- 1) the focal point shifts away from the lens by a small distance.
 - 2) the focus remains undisturbed.
 - 3) the focus shifts to infinity.
 - 4) the focal point shifts towards the lens by a small distance.

(Space for Rough Work)

- (Space for Rough Work)

31. An uncharged sphere of metal is placed inside a charged parallel plate capacitor. The lines of force will look like



32. A wire has a resistance of $6\ \Omega$. It is cut into two parts and both half values are connected in parallel. The new resistance is

1) $12\ \Omega$

2) $1.5\ \Omega$

3) $3\ \Omega$

4) $6\ \Omega$

33. A current flows in a conductor from east to west. The direction of the magnetic field at a point above the conductor is

1) towards north

2) towards south

3) towards east

4) towards west

34. A bar magnet is equivalent to

1) solenoid carrying current

2) circular coil carrying current

3) torroid carrying current

4) straight conductor carrying current

35. Excitation energy of a hydrogen like ion in its first excitation state is $40.8\ \text{eV}$. Energy needed to remove the electron from the ion in ground state is

1) $54.4\ \text{eV}$

2) $13.6\ \text{eV}$

3) $40.8\ \text{eV}$

4) $27.2\ \text{eV}$

(Space for Rough Work)

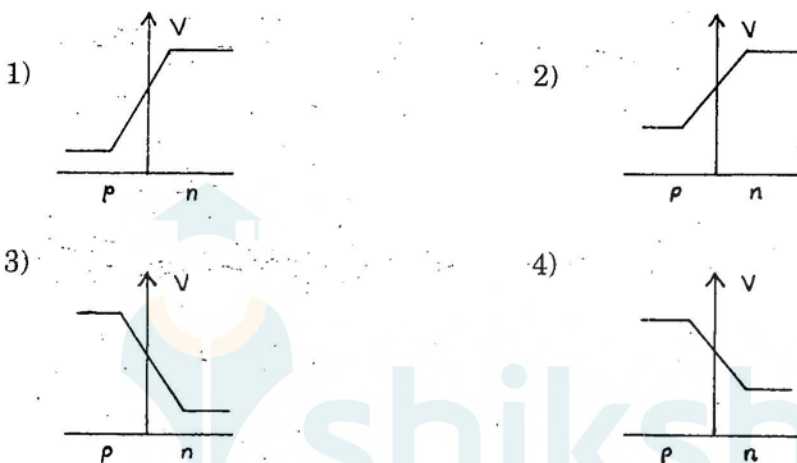
36. Threshold wavelength for photoelectric emission from a metal surface is $5200 \text{ \AA}$. Photoelectrons will be emitted when this surface is illuminated with monochromatic radiation from

- | | |
|-----------------|-----------------|
| 1) 50 W IR lamp | 2) 10 W IR lamp |
| 3) 1 W IR lamp | 4) 50 W UV lamp |

37. The emitter-base junction of a transistor is biased while the collector-base junction is biased.

- | | |
|---------------------|---------------------|
| 1) reverse, forward | 2) reverse, reverse |
| 3) forward, forward | 4) forward, reverse |

38. In a forward biased p-n junction diode, the potential barrier in the depletion region is of the form



39. A cylinder of radius r and length l is placed in an uniform electric field E parallel to the axis of the cylinder. The total flux for the surface of the cylinder is given by

- | | |
|----------------|---------------------------|
| 1) $\pi r^2 E$ | 2) $(\pi r^2 + \pi l^2)E$ |
| 3) zero | 4) $2\pi r^2 E$ |

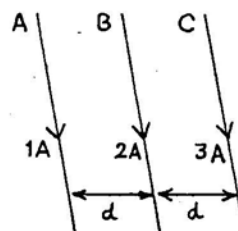
40. Two electric bulbs A and B are rated as 60 W and 100 W. They are connected in parallel to the same source. Then,

- 1) both draw the same current
- 2) A draws more current than B
- 3) B draws more current than A
- 4) current drawn are in the ratio of their resistances.

(Space for Rough Work)

41. Three long straight wires A, B and C are carrying currents as shown in figure. Then the resultant force on B is directed

- 1) towards A.
- 2) towards C.
- 3) perpendicular to the plane of paper and outward.
- 4) perpendicular to the plane of paper and inward.



42. Curie-Weiss law is obeyed by iron at a temperature

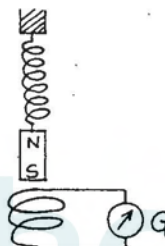
- 1) below Curie temperature
- 2) above Curie temperature
- 3) at Curie temperature only
- 4) at all temperatures

43. The dimensional formula for inductance is

- 1) $ML^2 T^{-1} A^{-2}$
- 2) $ML^2 T^{-2} A^{-1}$
- 3) $ML^2 T^{-2} A^{-2}$
- 4) $ML^2 T A^{-2}$

44. A magnet NS is suspended from a spring and while it oscillates, the magnet moves in and out of the coil C. The coil is connected to a galvanometer G. Then, as the magnet oscillates,

- 1) G shows deflection to the left and right with constant amplitude.
- 2) G shows deflection on one side.
- 3) G shows no deflection.
- 4) G shows deflection to the left and right but the amplitude steadily decreases.



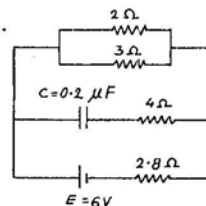
45. The maximum current that can be measured by a galvanometer of resistance $40\ \Omega$ is 10 mA. It is converted into a voltmeter that can read upto 50 V. The resistance to be connected in series with the galvanometer is (in ohm)

- 1) 5040
- 2) 4960
- 3) 2010
- 4) 4050

(Space for Rough Work)

- [illegible]

- 1) 0.9 A 2) 1.5 A
3) 0.6 A 4) 1.2 A



- 1) 3π
2) 30π
3) 300π
4) 3000π

- 1) 50 V 2) 70 V
3) 130 V 4) 10 V

- 1) 2 A
2) 1 A
3) 0.5 A
4) 0.25 A

(Space for Rough Work)

51. The spectrum obtained from the chromosphere of the sun at the time of total solar eclipse is
- 1) continuous emission spectrum.
 - 2) line absorption spectrum.
 - 3) line emission spectrum.
 - 4) band absorption spectrum
52. Heavy water is
- 1) water, in which soap does not lather
 - 2) compound of heavy oxygen and heavy hydrogen
 - 3) compound of deuterium and oxygen
 - 4) water at 4°C
53. The nuclear reactor at Kaiga is a
- 1) breeder reactor
 - 2) power reactor
 - 3) research reactor
 - 4) fusion reactor
54. When a body moves in a circular path, no work is done by the force since,
- 1) there is no displacement
 - 2) there is no net force
 - 3) force and displacement are perpendicular to each other
 - 4) the force is always away from the centre
55. A bullet moving with a speed of 100 ms^{-1} can just penetrate two planks of equal thickness. Then, the number of such planks penetrated by the same bullet when the speed is doubled will be
- 1) 4
 - 2) 8
 - 3) 6
 - 4) 10

(Space for Rough Work)

